

## Seroepidemiology of Crimean-Congo hemorrhagic fever in the local and imported sheep in Isfahan province, Iran, 2002

Behrooz Ataei<sup>1</sup>, Hamid Reza Touluei<sup>2</sup>, Sadegh Chinikar<sup>3</sup>, Mohammad Darvishi<sup>1</sup>, Navid Jalali<sup>1</sup>, Morteza Izadi<sup>1</sup>, Owrang Eilami<sup>1</sup>, Mehdi Mirkhani<sup>1</sup>, Masoud Mardani<sup>4</sup>

<sup>1</sup> Department of Infectious Diseases and Tropical Medicine, Isfahan University of Medical Sciences, Tehran, Iran

<sup>2</sup> Executive assistant of Health Centre in Isfahan province, Iran

<sup>3</sup> National Laboratory of Arboviruses and Viral Hemorrhagic Fevers, Pasteur Institute of Iran

<sup>4</sup> Infectious Diseases and Tropical Medicine Research Center, Shaheed Beheshti University of Medical Sciences, Tehran, Iran

---

### ABSTRACT

**Background:** Crimean-Congo hemorrhagic fever (CCHF) is an arboviral zoonotic infection with several reported cases in Iran. The present study was conducted with the aim of establishing effective ways to reduce exposure to the infectious agent and to organize appropriate policies for importing animals.

**Materials and methods:** For this cross sectional study, 372 local and 372 imported sheep were randomly selected and the presence of CCHF-related IgG antibody and tick on their body were investigated.

**Results:** Totally, 286 (76.9%) of local and 223 (57.8%) of imported sheep were seropositive, however, their difference did not reach a statistical significant level. Ticks were found on the body surface of 115 (31%) local sheep, but imported sheep lacked any tick on their body.

**Conclusion:** Our results revealed the endemic spreading of CCHF in sheep in Isfahan province. Further studies in other parts of Iran may pave the way for better understanding of the CCHF epidemiology in Iran.

**Keywords:** Crimean-Congo hemorrhagic fever, sheep, Iran.

(Iranian Journal of Clinical Infectious Diseases 2006;1(1):19-23).

---

### INTRODUCTION

Crimean-Congo hemorrhagic fever (CCHF) which can be seen in Asia, Far East (west of China), Africa and Europe, is an acute febrile hemorrhagic disease that could be transmitted by tick. Nosocomial infection is not uncommon. Instead of infectivity among animals, several

reports of sporadic infections and epidemics in populations have been mentioned (1,2). CCHF was first described by Shomakov in Crimean region in 1944 and 1945 as an acute febrile disorder with hemorrhagic manifestations (2-5). Nearly 10 years later, Congo virus was extracted from the blood of Congolese feverish children. Casals revealed that serologic differentiation between Crimean hemorrhagic fever virus and Congo virus is

---

Received: 21 April 2005 Accepted: 7 September 2005

**Reprint or Correspondence:** Behrooz Ataei, MD.  
Department of Infectious Diseases and Tropical Medicine,  
Isfahan University of Medical Sciences.

**E-mail:** Behata007@yahoo.com

## 20 seroepidemiology of CCHF

impossible, so it was called Crimean-Congo hemorrhagic fever (CCHF) (4,5).

CCHF is caused by a virus from the Bunyaviridae family and Nairovirus group which can be transmitted by tick bite from an infected animal or their infected products, or even from human beings. A Hyalomma type of ticks, usually *Hyalomma marginatum* and *Hyalomma anatolicum* groups, is the other way for virus transmission while rat, porcupine, sheep and cow are the responsible carriers (1,3-6).

In Iran, the presence of CCHF was first approved by Shomakov and his colleagues in 1970. CCHF antibodies were detected in 45 sheep's sera samples (2,4,5). In 1975, Saiedi et al detected seropositive samples in sheep (38%), goats (36%) and cows (18%) in Tabriz, Sarab, Rasht, Gorgan, Mashhad, Isfahan and Tehran (7), a finding that revealed CCHF as an endemic infectious disease in Iran, however, till 1999 CCHF was not reported in Iranian population. On July and September 1999, several cases of CCHF were reported through out Iran. Among Iranian neighbours, CCHF was also reported from Pakistan (8,9), Afghanistan(10), Turkey(11), Kuwait(12), Oman(13), United Arab Emirates (14,15), Iraq (16,17), Saudi Arabia(18,19), Azerbaijan(20), and Kazakhstan (21). Seroepidemiologic investigations in imported and local animals are of utmost importance since immigration to Iran, especially in the areas around Isfahan province, was contemporaneous with the animal transfers and neglected the rules of guarantee. On the other hand, WHO has announced the outbreaks of infection in Pakistan and Afghanistan in 1998 and 2000 (9,10), therefore, further inspections should be observed in this regard.

The present study was conducted from April 2001 to March 2002 among local and imported sheep in Isfahan province in order to organize an appropriate policy for imported animals.

## PATIENTS and METHODS

The city of Naeen is the entry gate of imported sheep to Isfahan province. Totally, 372 imported sheep were selected randomly. Special forms, indicating the presence or absence of tick on their body, were completed for selected sheep. Meanwhile, blood samples were obtained and sent to the laboratory. Local animals were treated the same. A total 372 local sheep were investigated in our study.

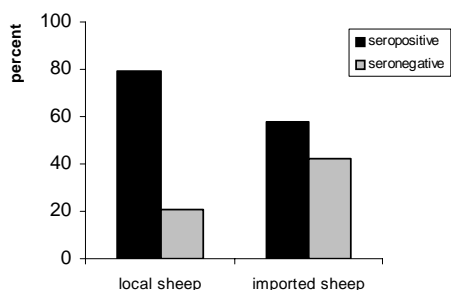
Sample sending strategy was compatible with the standard orders of Arbovirus reference laboratory of Iranian Pasteur Institute. ELISA technique was applied for IgG detection and positive CCHF samples were recognized. Laboratory results with the allocated codes were sent together for further evaluation and these data's were added to each sheep's check list. During the blood sampling phase, presence or absence of tick on sheep's body was evaluated by a veterinary expert and inserted in the animal check list.

Data were analysed using SPSS software (version 11.0, SPSS Inc., USA) and the prevalence of seropositive samples were compared between imported and local sheep by means of chi square.

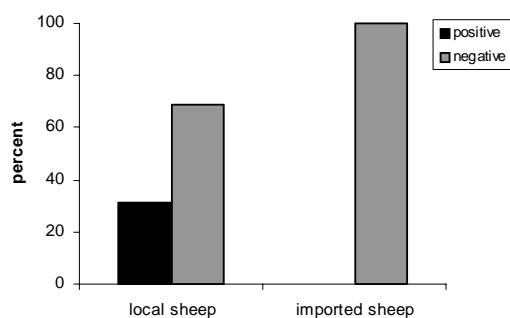
## RESULTS

Of 372 local sheep in Isfahan province, 286(78.9%) were seropositive for CCHF as compared to 215(57.8%) seropositive imported sheep. The difference in seropositivity for CCHF did not reach a statistical significant level between local and imported sheep ( $p=0.09$ ). Figure 1 shows the relative prevalence of CCHF serology in local and imported sheep in Isfahan province.

Ticks were detected on 115(30.9%) local sheep, however, none of the imported sheep had tick. Figure 2 shows the relative prevalence of tick in local and imported sheep in Isfahan province



**Figure 1.** Frequency of CCHF serology in local and imported sheep in Isfahan province



**Figure 2.** Frequency of tick on local and imported sheep's body in Isfahan province

## DISCUSSION

Crimean-Congo hemorrhagic fever (CCHF) is a well-known infectious disease in Iran since its first report in 1975; however, CCHF primary serological studies have been commenced since 1969. For this cross sectional study, we have tested the blood samples of imported and local sheep in Isfahan province located in the central part of Iran.

In 1975, a detailed study was achieved in the northern part of Iran with the cooperation of the University of Yale to determine the presence of anti-CCHF antibody using the agar gel diffusion precipitation (AGDP) method. In this study, 46 (of 351 human participants) were positive for CCHF as

well 38% of sheep, 36% of goats and 18% of cows. On the other hand, positive reports of AGDP method in other animals have proposed this diagnostic modality as a non-sensitive and non-specific test for CCHF diagnosis (5).

Hoogstraal reported CCHF in 2 of 19 non-specific vampires in Pyrenees's area near Catalan, 6 of 687 cows, 5 of 48 sheep in Hungary and 23 of 233 cows in Afghanistan (22). Positive samples among sheep, goats, camels and also one case of positive human serum were reported from Egypt (5).

Two separate reports from Saudi Arabia demonstrated the presence of CCHF in imported animals, farmers and workers in the quarantine stations of animals. They revealed a high prevalence of CCHF antibody in ruminants, especially those coming from Sudan. Totally, 4.1% of sheep, 3.2% of goats and just 0.8% of human beings have antibodies against CCHF (18,19). Globally, in areas where viruses can be detected, antibodies can be seen in animals' blood samples especially in sheep and cows.

In 1970, Shomakov and colleagues confirmed the presence of CCHF in Iran. They extracted the CCHF antibody from 45 serum samples which have been sent to Moscow. During the years 1970 and 1971, Shomakov and Smirnova examined the serum samples of 580 cows, sheep, goats, camels, wild animals and patients with unknown fever from all over Iran, however, CCHF antibody was not found in human beings. In contrary, 19% of cows, and 45% of sheep and goats in 1970 and 19% of cows and 49% of sheep were seropositive in 1971. Of these, 62% of studied sheep in northern Iran and 28% of sheep in north eastern Iran have CCHF antibody (2,7). Saidi and colleagues have reported CCHF antibody in %48 of 351 studied patients aged 3-70 years. They were living around Caspian Sea region and eastern Azerbaijan. Contrary, serum samples were negative in all 157 camels which have been selected from south or south east of Iran (7). Domestic animals' sera from Tabriz, Sarab,

## 22 seroepidemiology of CCHF

Rasht, Gorgan, Mashhad, Isfahan and Tehran provinces (northern provinces of Iran) were positive in 38% of sheep (near Caspian Sea), 36% of goats and 18% of cows (7). Chinikar et al have examined the sera of 1205 domestic animals from different regions of the country and reported specific IgG antibodies in 358 serum samples (2).

Our results revealed a high prevalence of seropositivity among sheep (78.9% of local and 57.8% of imported sheep). This simply implies our shortage in sanitation programs. Indeed, we should arrange better sanitation and eradication of CCHF vectors and instruct our medical veterinarian staff in this regard.

As mentioned before, CCHF is an endemic infectious disease in Iran and other central part of Asia and regions around Persian Gulf, therefore, imported sheep should be inspected more carefully, however, promoting the sanitation programs should also take into account for domestic animals.

Finally, authorities should pay further attention to the preventive measurements regarding the exposure and contact with animals and their products.

## REFERENCES

1. Report of the Iranian Ministry of Health, Treatment and Medical Education about CCHF. Prevention and fight with infectious disease. Kashan University of Medical Science, Deputy of Health, 2001.
2. Chinikar S, Fayaz A, Mirahmadi R, et al. Serological study of human and animals which are possibly infected with CCHF with specific ELISA method in different areas in Iran. *Hakim Research Journal* 2001;4(4):294-300.
3. Swanepole R. Crimean–Congo hemorrhagic fever. In: Palmer SR, Soulsby EJJ, Simpson DIH, editors. *Zoonosis*. Oxford, Oxford University press, 1998; p: 461-70.
4. Shirzadi MR, Shah-Nazari S. CCHF and other viral hemorrhagic fevers. Tehran, Seda Publication centre, 2002.
5. Moniri R, Dastehgoli K, Noroozi M. Crimean–Congo hemorrhagic fever. Tehran, Teymorzadeh Publication Institute, 2001.
6. Peters CJ. California encephalitis, hantavirus pulmonary syndrome and Bunyavirid hemorrhagic fevers. In: Mandell JL, Bennett JE, Dolin R, editors. *Mandell, Douglas, and Bennett's principles and practice of infectious diseases*. 6<sup>th</sup> edition, New York, Churchill Livingstone, 2005; p: 2086-90.
7. Saidi S, Casals J, Faghieh MA. Crimean hemorrhagic fever-Congo (CHF-C) virus antibodies in men, and in domestic and small mammals in Iran. *Am J Trop Med Hyg* 1975;24(2):353-57.
8. Altaf A, Luby S, Ahmad A J, et al. Outbreak of Crimean-Congo hemorrhagic fever in Quetta, Pakistan: contact tracing and risk assessment. *Trop Med Int Health* 1998;3:878-82.
9. WHO. Outbreak news, media reports of Crimean-Congo hemorrhagic fever, Pakistan. *Weekly Epidemiological Record* 2001;41:317-24.
10. WHO. Acute hemorrhagic fever syndrome, Afghanistan. *Weekly Epidemiological Record* 2000;25: 201-2.
11. Karti SS, Odabasi Z, Korten V, et al. Crimean-Congo hemorrhagic fever in Turkey. *Emerg Infect Dis* 2004;10(8):1379-84.
12. Al-Nakib W, Lioyd G, El-Mekki A, et al. Preliminary report on arbovirus antibody prevalence among patients in Kuwait: evidence of Congo-Crimean virus infection. *Transactions of the Royal Society of Tropical Medicine & Hygiene*. 1984;78:474-76.
13. Williams RJ, Busaidy S, Mehta FR, et al. Crimean-Congo hemorrhagic fever: A seroepidemiological and tick survey in the Sultanate of Oman. *Trop Med Hyg* 2000;5:99-106.
14. Rodriguez LL, Maupin GO, Ksiazek TG, et al. Molecular investigation of a multisource outbreak of Crimean-Congo hemorrhagic fever in the United Arab Emirates. *Am J Trop Med Hyg* 1997;57:508-12.
15. Khan AS, Maupin GO, Rollin PE, et al. An outbreak of Crimean-Congo hemorrhagic fever in the United Arab Emirates, 1994-1995. *Am J Trop Med Hyg* 1997;57:519-25.
16. Tantawi HH, Al-Moslih MI, Al-Janabi NY, et al. Crimean-Congo hemorrhagic fever virus in Iraq: isolation, identification and electron microscopy. *Acta Virol (Praha)* 1980;24:464-67.
17. Al-Tikriti SK, Al-Ani F, Jurji FJ, et al. Congo/Crimean hemorrhagic fever in Iraq. *Bull World Health Organ* 1981;59:85–90.

18. Hassanein KM, el-Azazy OM, Yousef HM. Detection of Crimean-Congo hemorrhagic fever virus antibodies in humans and imported livestock in Saudi Arabia. *Transactions of the Royal Society of Tropical Medicine & Hygiene* 1997;91:536-37.
19. El-Azazy OM, Scrimgeour EM. Crimean-Congo hemorrhagic fever virus infection in the western province of Saudi Arabia. *Transactions of the Royal Society of Tropical Medicine & Hygiene* 1997;91:275-78.
20. Smirnova SE, Sedova AG, Zimina Iuv, et al. Cases of Crimean-Congo hemorrhagic fever in Astrakhan Province. *Vopr Virusol* 1990;35:228-31.
21. Iashina LN, Petrov VS, Petrova ID, et al. Genetic identification of the Crimean-Congo hemorrhagic fever virus during epidemic outbreak in Kazakhstan in 2000 [Russian]. *Mol Gen Mikrobiol Virusol* 2002;4:31–5.
22. Hoogstraal H. The epidemiology of tick-born Crimean-Congo hemorrhagic fever in Asia, Europe, and Africa. *J Med Entomol* 1979;15:407-17.